Contents

Section 2

West Desert Basin

Executive Summary

2.1 FOREWORD

The State Water Plan provides a foundation for state water policy. This helps the state meet its obligation to plan and implement programs to best serve the needs of the people. This is the last of the detailed basin plans associated with the State Water Plan. Plans have already been completed for the other 10 basins of the state: Bear River, Cedar/Beaver, Kanab Creek/Virgin River, Weber River, Jordan River, Utah Lake, Sevier River, Uintah, West Colorado, and Southeast Colorado hydrologic basins. These plans have all been prepared under the direction of the Board of Water Resources.

This section summarizes the 19 sections of the West Desert Basin Plan. The plan contains 19 sections and is modeled after the State Water Plan (1990). In addition, it contains Section A; Acronyms, Abbreviations and Definitions, and Section B; Bibliography.

2.3 INTRODUCTION

The main purpose of this basin plan is to inventory existing resources, assess existing conditions, identify problems and issues and describe potential development alternatives for meeting the water needs of future generations. The State Water Plan and individual river basin plans can provide guidance and help coordinate the planning efforts among all state, federal and local entities. The West Desert Basin Plan is prepared at a reconnaissance level, with a general assessment of problems and needs. The preparation of this plan has involved many local, state and federal entities who have expertise regarding water resources.

The West Desert Basin is located in the northwest corner of the state and extends along the Nevada state line, into the southern portion of the state (Figure 3-1). It is bounded to the east by the Bear River Basin, the Weber River Basin, the Jordan River Basin, the Utah Lake Basin, the Sevier River Basin and to the south by the Cedar/Beaver Basin. Included in this report is the Columbia River Basin, 393 square miles in the extreme northwest corner of the state which drains via Goose Creek north and into the Snake River.

The West Desert Basin, including the Great Salt Lake, comprises roughly 11.7 million acres, or approximately 22 percent of the state's total area. By contrast, it is home to just over 38,500 residents or about 1.8 percent of the state's total population. Approximately 88 percent of the basin's population, or roughly 33,860 people, reside on 7 percent of the basin's land, in Tooele and Rush valleys. The remaining nearly 4,660 residents of the basin reside on the remaining 93 percent of the basin's land at a population density of approximately one resident per 6 square miles.

The West Desert Basin consists primarily of broad arid valleys separated and bounded by a series of mountainous regions. These mountains serve as catchment areas for precipitation in the

form of snow in the winter and rain at other times of the year, providing the desert valleys with intermittent and ephemeral streams. Although many streams flow perennially in the mountain canyons, only a few, such as Blue Creek in Box Elder County, flow year round once they reach the desert valleys. Several agricultural communities have developed and even flourished in the desert valley environments through prudent use of the limited groundwater and surface water supplies.

The salinity of the Great Salt Lake has rendered it of little value for municipal, agricultural, or most other uses. Mineral extraction industries around the Great Salt Lake, however, provide hundreds of jobs and represent millions of dollars to the Utah economy. The brine shrimp industry also provides significant jobs and considerable economic benefits to the state. In addition to these economic values, the Great Salt Lake is a unique environmental habitat, visited by millions of migratory birds annually, and home to many thousands of birds and other wildlife living in the approximately 250,000 acres (including wetlands in the Jordan and Weber river basins) of wetlands presently existing around the lake. Despite its size the Great Salt Lake is sensitive to pollution. The primary issues currently affecting the Great Salt Lake are:

- The impact upon wetlands and bird habitat by encroaching development;
- Unbalanced salinity levels between the north and south arms of the lake;
- Reduced brine shrimp populations due to the salinity imbalance, and;
- Uncontrolled flow of nutrients and toxic pollutants into a lake that essentially has no water quality standards established to safeguard its water quality.

2.4 DEMOGRAPHICS AND ECONOMIC FUTURE

The West Desert Basin is one of the most sparsely populated areas- - not only of Utah but of the Intermountain West. Tooele City, with an estimated current population of just over 20,000 people, is the largest city in the basin and Grantsville is the second most populous with nearly 6,000.

Much of the terrain throughout the basin is either too rugged, too dry or too saline to attract large numbers of settlers or entrepreneurs. Aside from the Tooele Valley, which, since the last decade has experienced significant growth, it is unlikely the basin will see large population increases in the foreseeable future. In 1996, just under 32,000 people were permanent residents in the basin. This is expected to increase to 38,500 by 2000, and to about 68,200 by 2020. This is an increase of almost 36,500 people or roughly 115 percent. The annual rate of population growth is approximately 2.8 percent.

The basin's employment base is centered in Tooele Valley and in the salt, mineral and brine related industries located near the Great Salt Lake. Agriculture in Tooele County is expected to lose jobs gradually, while mining jobs will increase slowly. Construction, manufacturing, TCPU (transportation - communication and public utilities) and government jobs will all increase between 30 percent and 60 percent by the year 2020. High growth sectors for the same period are trade (78 percent), FIRE (finance, insurance and real estate) (73 percent), services (106 percent), and non-farm proprietors (91 percent).

As in most areas of the state, service and trade sectors will be the leading sources of jobs with government employment growing at about the rate of population increases. Industries located on the Great Salt Lake are expected to continue providing employment to Wasatch Front and West Desert basin residents.

2.5 WATER SUPPLY AND USE

The West Desert Basin includes some of the most arid lands in the western United States. Surface water sources are scarce and most often intermittent. Consequently, residents of the basin have come to rely heavily upon groundwater resources. Although surface water

sources have been developed for agricultural uses, municipalities have come to rely exclusively upon groundwater supplies.

The Great Salt Lake receives a total annual inflow of just over 3.5 million acre-feet. The West Desert Basin contributes just 2 percent of that total (54,000 acre-feet), primarily in the form of sub-surface flow (See Table 5-4). The largest contribution to the Great Salt Lake comes from the Bear River basin, just over 40.5 percent or 1.45 million acre-feet. Direct precipitation on the lake adds 1.0 million acre-feet or 28 percent of the annual inflow, while the Weber River contributes 18 percent (640,300 acre-feet) and the Jordan River adds 12 percent (438,000 acre-feet) of the Great Salt Lake's annual inflow.

Tooele Valley and Great Salt Lake

All of the basin's community water systems obtain their culinary water supplies exclusively from groundwater sources (See Table 5-5). The public community water systems for Juab and Millard counties obtain water from wells, while Box Elder and Tooele counties' communities have a mix of well and spring sources for their municipal and industrial water supplies. The basin's community water systems have a total available water supply of 25,870 acre-feet per year. Non-community water systems provide an additional 490 acre-feet per year, while self-supplied industrial sources have 3,760 acre-feet per year. Private domestic systems are estimated to provide users with 690 acre-feet per year. This puts the total municipal and industrial water supply in the West Desert Basin at 30,810 acre-feet per year.

The total culinary use from the basin's community water systems is 7,080 acre-feet per year, or less than a third of the existing M & I water supply. For most communities in the basin the limiting factor is not the existing water supply, but the water system's capacity.

Agricultural use is the largest single use of fresh water in the West Desert Basin. It is estimated that 181,700 acre-feet of water is used to irrigate 78,770 acres. This is about 2.4 acre-feet per acre and an indication that there are significant water shortages in the agricultural sector. Typically throughout the basin the allocated water right is 4 acre-feet per acre.

2.6 MANAGEMENT

Management is the responsibility for control, augmentation and use of a water supply, including diversion, transmission, treatment, storage, distribution and control of use. As was true in most other areas of the state, water supplies in the early years of settlement were managed by bishops of the Church of Jesus Christ of Latter-day Saints. Later, irrigators organized irrigation companies to manage the water resources. Culinary water systems were established soon after settlement to meet domestic needs. They now operate under guidelines established by federal regulations and state rules administered by the Division of Water Rights and the Division of Drinking Water.

In 1869 the Southern Pacific Railroad constructed Rosebud Reservoir south of Park Valley. This was the first of twenty-four reservoirs constructed in the basin. Most of these reservoirs are used today to store irrigation water, but other uses include wildlife habitat, flood control and tailings storage. See Table 6-1 for a list of the basin's reservoirs and Figure 6-1 for their locations.

Incorporated mutual irrigation companies serve the majority of irrigated land in the basin. Only 30 of the companies listed in the Division of Water Right's publication, *Water Companies*

in Utah, have service areas exceeding 100 acres (See Table 6-2).

The Great Salt Lake provides hundreds of jobs and brings millions of dollars into the Utah economy through the mineral extraction and brine shrimp industries. At the same time, the Great Salt Lake provides a unique environmental habitat for many millions of migratory birds as well as many thousands of resident birds and other wildlife that inhabit the 250,000 acres of wetlands along the lake shoreline. The competing interests of wildlife and industry make management of the lake a complicated issue. On March 1, 2000 the Utah Department of Natural Resources published the Great Salt Lake Comprehensive Management Plan and Decision Document. This document reflects the input of many state agencies and establishes the guidlelines for the future management of the Great Salt Lake.

Between 1983 and 1987, the Great Salt Lake, in response to record rainfalls and unseasonable cool and wet springs, rose dramatically to a historic record high elevation of about 4212 feet above MSL.

The high water flooded wastewater treatment facilities, power lines, dikes and wetlands at the wildlife refuges, and private duck clubs, as well as dikes and evaporating ponds at many commercial mineral extraction facilities along the lake's shoreline. The high water also threatened freeways, railway lines, additional wastewater treatment facilities, and power lines, and caused further damage to the already impacted mineral mining companies and wildlife facilities around the lake.

In an effort to reduce the flooding around the lake, the state breached the railroad causeway on August 1, 1984. The lake was so high, however, that breaching was viewed as an interim measure until a more permanent solution could be found. Between 1984 and 1986 many alternatives were investigated in order to determine the best way to address the continued rise of the Great Salt Lake. The West Desert Pumping Project was constructed on the western shore of the lake and delivered water to the diked New Foundland Evaporation Pond in the west desert. Great Salt Lake water was pumped into the west desert from May of 1987 through June of 1989. During that period of time the project lowered the lake approximately 26 inches. Today the pumps remain in place as insurance to reduce the impact of flooding should the Great Salt Lake again rise to elevations similar to those of the mid '80s.

2.7 REGULATION/INSTITUTIONAL CONSIDERATIONS

State agencies are required by law to provide administrative control and regulatory authority over the state's water resources. The State Engineer, as Director of the Division of Water Rights, has responsibility for administering water rights and for dam safety. Currently, there are three dams, Blue Creek, Grantsville, and Settlement Canyon that are rated high hazard, not because of their condition but because of the potential to cause loss of life and considerable property damage if they failed.

Settlement Canyon Reservoir

Water quality regulations are administered by the Water Quality Board and the Drinking Water Board within the Department of Environmental Quality. The Utah Water Quality Board has developed rules, regulations, policies and planning processes necessary to prevent, control and abate new or existing pollution of surface water and groundwater. These are carried out by the Department of Environmental

Quality, Division of Water Quality. The Division of Drinking Water serves as staff for the Drinking Water Board to assure compliance with federal regulations and state rules.

Other entities also have responsibilities for regulating and managing certain aspects of the water resources. These include mutual irrigation companies, water conservancy districts, special service districts, drainage districts, cities and towns. These entities can levy taxes and assessments for maintenance and operation of their facilities.

2.8 WATER FUNDING PROGRAMS

Funding has always been an important part of water resource development. In Utah's early years, individuals, private irrigation companies and the Church of Jesus Christ of Latter-day Saints worked together to develop water facilities. Today, private citizens still play an important role in funding water development projects. The federal and state governments have developed numerous programs which make grants and low-interest loan money available for water development. Many of these funding programs require up-front cost-sharing from individuals, groups or entities receiving benefits from the projects or complete repayment of revolving loan funds.

2.9 WATER PLANNING AND DEVELOPMENT

Water development began with the first settlements of pioneers in the late 1840s. In 1847 and 1848 prior to any settlement, Tooele and Rush valleys were used as a herd ground for cattle. In September of 1849, the first white settlers came into Tooele Valley and settled south of the present site of Tooele. Settlement in the Grantsville area started the following year. Over the course of the next few decades, settlements were established throughout the Tooele and Rush Valleys as well as other areas of the basin: Snowville, Park Valley and Grouse Creek to the north, Callao to the south, and later Wendover to the west. Except for Wendover, these communities were located in valleys where mountain streams could be developed for irrigation use. During the same period of time, wells were dug to provide culinary water for the settlements. Over the years, the Board of Water Resources has provided technical assistance and funding for 53 projects in the West Desert Basin totaling just over $13.2 million.

Despite the basin's limited water resources, the M&I water supplies for most communities are adequate to meet not only today's needs but the projected needs through 2020. This is because of the relatively small populations and because water purveyors have acquired adequate groundwater rights to provide for future M&I water needs. Even where water supplies are short, (Erda, Lincoln, Vernon, the S&W Trailer Park and the Goshute Indian Reservation) adequate supplies are available either through development of new sources, or the purchase of existing rights.

Although most of the basin's community water systems have an adequate water supply through the year 2020 many do not have sufficient carrying capacity to deliver the demand that is projected for the year 2020. Except for Dugway, Stockton and Wendover, all of the Tooele County community water systems have insufficient system capacity to meet the 2020 demand. The Goshute Indian Reservation also has inadequate system capacity to meet the 2020 demand. The community water systems in Box Elder County (Grouse Creek, Howell, and Snowville) and the Eskdale Community Water System in Millard County all have sufficient capacity for their 2020 demand.

Residents in Snowville and Curlew Valley have expressed concern that development in the northern end of the valley, in Idaho, will reduce groundwater supplies. An estimated 20,000 acre-feet of groundwater flows annually across the state line from Idaho into the Utah portion of Curlew Valley. Without some type of

agreement between the states as to how to handle this problem, this concern could become a serious issue.

Residents of Eskdale have expressed a concern that developers in southern Nevada have shown interest in tapping into unused groundwater supplies in Snake Valley. Their concern is that mining of the Creek Valley groundwater could leave them with lowered water levels in their wells and reduced water quality.

Growth over the past few years has taxed Tooele city's existing supplies and raised concerns about meeting the future water needs. A couple of recent developments, however, have brightened Tooele City's future water supply outlook. The city acquired the culinary water supplies of the recently closed Tooele Army Depot. Also, Tooele City has drilled three new and highly productive wells. These developments have resolved the city's water supply problems for the present and immediate future. Tooele City will still need to address its inadequate system capacity at some time in the near future.

Irrigation water use has remained stable over recent years. Although there is a significant amount of undeveloped arable land in the basin, development of new irrigated lands has been limited by the short supply of surface water, particularly in the late season. Currently, irrigated land within the basin is 78,770 acres. This is projected to change very little by the year 2020. One exception will be in the Tooele/Rush Valley area where population increases will reduce the amount of existing agricultural land, and likely result in some agricultural water supplies being converted to municipal and industrial uses.

The total per capita municipal and industrial water use (potable and non-potable) in the West Desert Basin is 260 gallons per person per day compared to the statewide average of 320 gallons per person per day.

The basin's projected population for the year 2020 is 61,850 people. Based upon the current average, the basin will need a total municipal and industrial water supply of 18,010 acre-feet per year in 2020. This is well within the basin's existing total municipal and industrial water supply of 30,810 acre-feet/year. For the county of Tooele, the projected population for the year 2020 is 59,680 people. Based upon Tooele County's average M&I use of 255 gallons per person per day, Tooele County will need 17,050 acre-feet per year in 2020. This is well within the county's existing M&I supply of 28,550 acre-feet per year.

Although water is scarce in the West Desert Basin there are still developable groundwater and surface water sources throughout much of the basin. The exceptions are Tooele Valley and the Snowville area which have been closed to the further appropriation of surface and groundwater. Any development of new surface water will likely mean the construction of a small reservoir to store springtime runoff. Although the basin does not have any large potential reservoir sites there are likely many locations where, if economically feasible, several hundred acre-feet of water could be captured and stored.

There is potential to stretch existing water supplies through a number of conservation practices. Water users may be able to better manage their supplies thereby increasing efficiencies which in turn can reduce costs. This applies to all water uses including residential, commercial, industrial and agricultural.

Weather modification or cloud seeding, has long been recognized as a means to enhance existing water supplies. There are two winter time cloud seeding projects using silver iodide in the West Desert Basin. The West Box Elder project which targets the watersheds of the Raft River Mountains, operated for 9 years from 1989 to 1997. The project was started again in the year 2000. A project in East Tooele County, targeting the watersheds of the Stansbury and Oquirrh Mountains, has operated for 16 years. The project operated from 1976 to 1983, 1989 to 1992 and 1996 to the present. Runoff analysis in

Utah indicates a 10 percent increase in April 1 snow water content will result in a 10 to 20 percent increase in the April-July runoff depending on individual watersheds.

2.10 AGRICULTURAL

Throughout the West Desert Basin, the greatest limitation to agricultural development and production has been the availability of water. There are approximately a million acres of arable land in the basin. Most of that land is not being cultivated because of the limited water supply.

Agriculture is a major industry in the basin and as such it has a direct impact on the economy of the area. Spinoff from agriculture helps support employment and production in other sectors along with providing economic diversity.

Historically, agriculture has played a key role in the basin's economy. While agriculture continues to be a significant source of income throughout much of the basin, Tooele Valley and Wendover have come to rely upon service and industry related jobs to fuel their economies. The close proximity of Tooele Valley to populated Salt Lake City has created a suburban type settings with many residents commuting to work in service or industry related fields. Still, even in these suburban areas, agricultural water use plays an important role in overall water planning, both in terms of quantity and quality. In many of the basin's smaller communities--from Snowville, Park Valley, and Grouse Creek in the north, to Callao, Partoun, Eskdale, and Garrison in the south--agricultural water is a key element to economic survival.

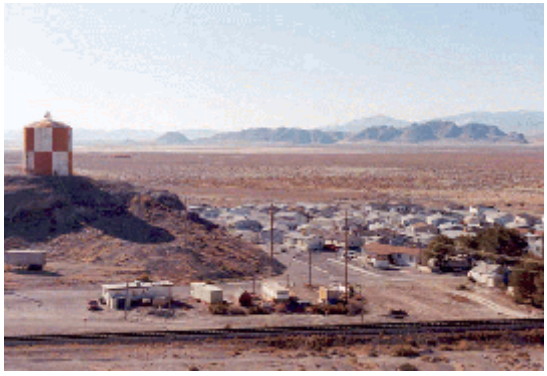
The majority of irrigated lands are used for the production of feed for cattle. Irrigated pasture land accounts for 30 percent, while alfalfa makes up 34 percent, of the irrigated ground. Various grains, corn and hay, as well as idle and fallow ground make up much of the remainder.

Today there are 78,770 acres of irrigated crop land within the basin, and just over 123,700 acres of dry-cropland. Approximately 178,000 acre-feet of water is diverted each year to irrigate the basin's 78,770 acres of irrigated ground. It is estimated that almost 108,000 acre-feet of the diverted water is depleted. Less than a tenth of one percent of the irrigated ground is used to produce high cash crops such as fruits and vegetables.

2.11 DRINKING WATER

Because of the limited surface water supply, towns and isolated residents throughout the basin are dependent upon groundwater for culinary water supplies. Public drinking water supplies throughout the basin come principally from wells (79 percent) and to a lesser extent from springs (21 percent). There are no surface water treatment plants in the basin. It is anticipated that new drinking water sources in the foreseeable future will come from groundwater supplies, either wells or springs, since they are more reliable and less expensive to develop than surface water sources and generally do not require the expensive treatment processes that surface waters do.

There are currently 18 community water systems in the West Desert Basin. There are an additional 18 non-community water systems. The basin's community water systems have a collective supply of 25,870 acre-feet/year. The basin's non-community water systems provide an additional 490 acre-feet of potable water annually.



Water tank on the outskirts of Wendover

For much of the basin, growth does not loom as a serious problem. This is particularly true for the small rural communities where growth in recent years has been slight to non-existent. For many of these areas, even a doubling of the population would not represent a significant increase in the number of people. In Tooele Valley and Wendover, however, relatively high growth rates are expected. Fortunately, the county and city planners in these areas have already addressed the issue. Wendover, Utah, and West Wendover, Nevada, have addressed the issue jointly and have developed well and spring sources sufficient to supply their culinary water needs through 2020.

Tooele County has addressed the issue of growth in its Tooele County General Plan, November 1995, which projects adequate water supplies through the year 2020. The city of Tooele will be the most significantly impacted community, with its population projected to double by the year 2020. For some time, city planners were concerned about their ability to meet the water needs of such growth. But the recent addition of three successful new wells along with the purchase of existing water rights have dramatically improved Tooele city's water supply for the present and immediate future. As the year 2020 approaches however, Tooele city's population will again approach the limits of the city's water supply if additional water sources are not obtained. The data show nearly every community water system in the basin has adequate supplies to meet future needs through 2020. The exceptions in Tooele County are Lincoln Culinary Water and Erda Acres Water Company. Outside of Tooele County, the only community with an inadequate supply for their 2020 population projection is the Goshute Indian Reservation.

2.12 WATER QUALITY

There are 12 wastewater treatment plants in the basin. These are shown in Table 12-1. At the present time the Tooele Wastewater Treatment Plant discharges about one million gallons per day to an irrigation ditch. Plans are in place, however, to upgrade the treatment plant's efficiency, and in the near future use the effluent for irrigation at a local golf course.

The state agency charged with the responsibility to regulate water quality is the Utah Division of Water Quality within the Utah Department of Environmental Quality. Historically, water quality has been under jurisdiction separate from water quantity and the Division of Water Rights.

The West Desert Basin is free of any really significant water quality problems. Surface water streams arise in the mountains and remain relatively free of natural and man caused pollution to the point at which they are diverted for agricultural use. Groundwater tends to be high in TDS near the Great Salt Lake, but near the mountain benches where there is significant recharge, groundwater quality is generally good to excellent.

The basin's stream channels below the points of diversion are often dewatered or can have a high salinity problem. Some riparian areas have been degraded but there is not a lot of man caused water quality impacts within the basin.

2.13 DISASTER AND EMERGENCY RESPONSE

The history of water-related natural disasters in the West Desert Basin includes few significant floods or drought events. The sparse population has not encroached upon the natural waterways or taxed existing water supplies to the point that flooding or droughts have become a reoccurring problem. The floods of the mid-1980s, however, resulted in millions of dollars in property damage to businesses, public utilities and infrastructure. But these flooding problems were primarily associated with the rising level of the Great Salt Lake and the impact upon the lake's surrounding industries, roadways and railroad. Local flooding throughout the basin during that period was primarily due to elevated groundwater tables and an increase in artesian pressure. The extended drought years of the

late 1980s lowered reservoir storage levels significantly, and in some instances prompted consideration of restrictions for outdoor water use. But for the most part, the basin does not have as great a threat of flooding or drought as is found in much of the rest of the state. In spite of this basin's relatively low likelihood for natural disasters, the various counties of the basin currently have an existing policy to preserve rights-of-way over existing natural drainage ways to ensure that flood plains remain free of development.

Thunderstorms are common during the summer and fall months and produce localized cloudburst flooding. Although the total volume of water produced by these storms is comparatively small, the instantaneous and localized runoff rate can be high. Damage from thunderstorms most often takes the form of erosion and sediment transport and deposition. There can also be significant landslides and mud-flows resulting from these storms. Typically, these events occur along the hillsides or at the canyon mouths and adjacent residential developments.

Except for the Promontory Mountains, Blue Creek Valley and Hansel Valley, the West Desert Basin lies almost entirely outside of the Intermountian Seismic Belt. In recent years there has been considerable earthquake activity in and around Hansel Valley and Blue Creek Valley, and even some small earthquakes recorded at Lakeside, west of the Great Salt Lake. The rest of the basin has experienced little earthquake activity and virtually nothing above the 3.0 range on the Richter scale. Still there are faults present throughout the basin and there is potential for a large earthquake to occur. Additionally the soft sediments that make up the valley floors throughout the basin will easily convey and even magnify the ground movement associated with an earthquake over large distances. Consequently a large earthquake could cause structural damage to dams, water pipes, and water storage tanks which in turn could result in flooding problems and/or water shortages. Earthquake activity can also alter the yields from wells and springs.

The only reservoirs in the basin that represent a threat to human life and have therefore been given high hazard ratings are Settlement Canyon, Grantsville and Blue Creek Reservoirs. Of these three, only Blue Creek Reservoir is located in the area that most frequently experiences earthquakes. Settlement Canyon Reservoir, however, is on the west slope of the Oquirrh Mountains which have experienced few earthquakes over the years.

2.14 FISHERIES AND WATER-RELATED WILDLIFE

This is a typical high desert basin, which despite the relatively dry conditions supports a wide and abundant variety of desert wildlife. While the relatively small number of humans living in the basin have limited the impact upon the native environment and the native wildlife, it does not imply that there is not the potential for more significant impacts. The natural environment of the desert basin is a fragile one with the potential for significant impacts from only marginal changes in the environment.

Buffalo once grazed the grassier valleys of the eastern and northern portions of the basin. Today a buffalo herd is managed by the state on Antelope Island but the mule deer is now the principal big game animal in terms of numbers in the basin. Mule deer reside primarily in the foothills and mountains above 5,500 feet in elevation. Several antelope herds range in the valleys and plains of the central and western portions of the basin. Elk are well established in the Deep Creek Range and are in the Stansbury Range as well. A few black bears have survived in the mountain areas, and although cougars and bobcats were on the decrease during the first half of the century, it now appears that they are quite plentiful, along with a significant coyote population. Beavers are rare but marsh areas provide favorable habitat for muskrat. Upland areas support skunks, badgers and fox. Jack rabbits inhabit range lands and

cottontails are common on ranges and around farms. Common rodents include porcupines, ground squirrels, prairie dogs, chipmunks, and pack and kangaroo rats.

Thousands of birds are found in the marshes, in fresh water reservoirs and along the shorelines of the Great Salt Lake. Many migrating waterfowl stop here to rest, to feed or to nest and raise their young.

Deep Creek Mountains

Trout can be found in some of the mountain streams in the Stansbury Mountains, Pilot Mountains and Deep Creek Mountains. Trout can also be found in Goose Creek and the Raft River. Bonneville cutthroat trout are found in streams on the Deep Creek Mountains and Lahontan cutthroat trout are found in streams in the Pilot Mountains.

The West Desert provides winter habitat for a variety of raptor species. Bald eagles, rough-legged hawks and peregrine falcons are among the species that migrate into the West Desert valleys during the winter months, and golden eagles and red-tailed hawks are among the year-round residents. The ferruginous hawk, a state threatened species, nests in the West Desert and is particularly sensitive to human disturbance.

At the present time the biggest water-related wildlife problem in the West Desert Basin is the need to establish a comprehensive Great Salt Lake Management Plan that adequately addresses the wildlife issues associated with the Great Salt Lake and the surrounding wetlands. It is estimated that there are approximately 250,000 acres of wetlands surrounding the Great Salt Lake. This is a significant portion of the state's wetlands. At the same time, the Great Salt Lake is the ultimate receiving waters for storm runoff and wastewater treatment plant effluent from the million plus residents of the Wasatch Front and the Bear River Basin. For years storm runoff has carried toxic pollutants into the lake and wastewater treatment plant effluent has conveyed high nutrient loads into the lake. But there has been only limited scientific analysis of the impact these loads have had upon the Great Salt Lake.

2.15 WATER-RELATED RECREATION

Aside from the Great Salt Lake and a few small reservoirs, there are no major lakes or rivers in West Desert Basin. Consequently, except for activities on the Great Salt Lake and occasional water skiing on Rush Lake, there are few opportunities for recreational activities involving direct contact with water. The Fish Springs National Wildlife Refuge is located in the south-central portion of the Great Salt Lake Desert just east of Callao. This facility provides a unique recreational opportunity to visiting wildlife enthusiasts. Ultimately, its isolated setting results in few visitor-days to the refuge. In the northeast portion of the basin, the Great Salt Lake represents the largest recreational water attraction. Ever since the first settlers entered Salt Lake Valley, the Great Salt Lake has been a source of curiosity and a recreational attraction. Presently the recreational development along the shores of the Great Salt Lake have been confined to the east side counties (Salt Lake, Davis, and Morgan).

Other water-related recreational activities include a few city and county parks that offer picnicking and other day-use activities in the immediate proximity to ponds, small lakes and streams.

The Forest Service manages approximately 1,791,140 acres of land in the mountainous regions of the West Desert Basin. There are two state parks in the West Desert Basin: Antelope Island and Great Salt Lake. The

Fish Springs National Wildlife Refuge

federal government manages thousands of acres, including Golden Spike National Historical Site. The largest portion of federal managed lands in the West Desert Basin, however, include the Bureau of Land Management public domain lands and Forest Service lands.

The U.S. Forest Service manages two national forests within the boundaries of the basin. The Sawtooth National Forest is located within the Columbia River Basin in the Northwest corner of the state and sections of the Wasatch-Cache National Forest are located south and west of Tooele Valley in the Stansbury and Sheeprock Mountains. Through the U.S. Fish and Wildlife Service, the federal government manages Fish Springs National Wildlife Refuge just south of the Great Salt Lake Desert.

2.16 FEDERAL PLANNING AND DEVELOPMENT

The role of the federal government is changing from one of construction and development to one of management, preservation, conservation and maintenance. Federal funding programs are decreasing while regulatory programs are on the increase. With the change in federal agency activities, the state is being called upon to take a more active role in the planning and funding of local water projects. Although the federal government has decreased many funding programs, several federal agencies still have management responsibilities and regulatory authorities that are expected to continue indefinitely. Consequently, cooperative participation with federal agencies will continue to be very helpful to the state.

The primary concerns expressed by the various federal agencies in the 1990 Utah State Water Plan are: 1) Reserved water rights; 2) interrelated planning (multiple-use planning); 3) stream and riparian habitat loss; and, 4) water rights filings. An additional concern that has surfaced is coordination between federal, state and local officials. In recent years, progress has been made in each of these areas, particularly in the area of coordination between various federal, state and local agencies.

In the near future, a significant portion of the West Desert basin will be designated as wilderness. The bill currently before congress proposes wilderness designation for 1.1 million acres of BLM and Forest Service land located primarily in the Newfoundland Mountains, the Pilot Range, and the Silver Island Mountains. The bill, however, will face strong opposition from environmental lobbyists who would increase the area to 2.6 million acres primarily in the same areas but also including lands in the Grouse Creek Mountains. Aside from the impending wilderness designations there are no significant federal projects set for the immediate future in the West Desert Basin.

2.17 WATER CONSERVATION

Significant water use reductions can be, and have been, achieved when people understand the reasons to conserve, especially in times of drought. It must be remembered, though, that reducing demand for water is less important if there are no cost savings or if the water cannot be used for other desirable purposes.

Water conservation can be pursued through three strategies: (1) reducing water demand, (2) using the existing water supply more efficiently, and (3) increasing the water supply by operating the storage and delivery facilities more efficiently such as the elimination of conveyance losses, or through other means.

The current water right allotment for irrigation within the basin is four acre-feet per acre. This means ideally up to 295,600 acre-feet of water could be diverted annually for irrigation in the Great Salt Lake Desert and up to 20,800 acre-feet of water can be diverted in the Columbia River Drainage. In contrast to these allocation figures only an estimated 178,300 acre-feet of water is diverted for irrigation in the basin, including 12,200 acre-feet of estimated diversion in the Columbia River Drainage. Irrigators in the Columbia River Drainage divert only 63 percent of their allocated water right, while irrigators in the rest of the West Desert Basin divert only 56 percent of their allocated water right.

Of the four acre-feet allotment, about 2.3 acre-feet per acre is based on crop consumption. The remaining 1.7 acre-feet per acre is based on conveyance and application losses. Even if the conveyance and application losses could be entirely eliminated, the basin's irrigators would still need every bit of water they are currently diverting, and it still would not meet their crop consumption needs. Consequently, there is little opportunity for agricultural water conservation in the West Desert Basin. That is to say, agricultural water conservation would not result in reducing the amount of water diverted or consumed. Improving conveyance and application efficiencies would, however, stretch existing supplies to later in the season where storage is available and could result in higher crop yield.

The culinary water use for 1996 in the West Desert Basin was 260 gallons per capita per day (gpcd). This is well below the statewide average of 320 gpcd. Within the larger communities of Tooele and Grantsville, there are some effective water conservation measures that could be employed to reduce municipal water use. In any system there are unmetered water use and system losses. Although the unmetered uses include fire fighting and park watering, there is still potential for conserving residential water through maintenance and monitoring. Also, programs that improve efficiency of large landscaping systems, such as parks and cemeteries, can realize significant water reductions.

Even for the smaller communities unmetered water use and system losses likely exist. For these communities, as long as the existing supplies are adequate, such losses will probably go unchecked. But when existing supplies are stretched to their limits, it will be wise for such communities to consider conserving their existing supplies through metering and maintenance.

Water conservation measures discussed in this section include: Institutionalizing water conservation, public information and education, water measurement, landscaping and home water savings, pricing, secondary systems, conjunctive use, restricting water use, and wastewater reuse.

2.18 INDUSTRIAL WATER

There is no single agency or entity in Utah that regulates the development or use of industrial water, although its use must conform to existing state laws for water rights, pollution control and other regulations. The single biggest obstacle in identifying the basin's total industrial water use is the proprietary status with which many industries classify their water use statistics.

The primary industrial water use in the basin is for mineral extraction from Great Salt Lake. Six mining companies (AKZO Salt of Utah, Magnesium Corporation of America, Morton Salt, IMC Kalium Ogden Corp., (formerly Great Salt Lake Minerals), North American Salt Company and Mineral Resources International) annually use an estimated 170,961 acre-feet of Great Salt Lake water to extract salt, magnesium, potassium sulfate, magchloride, and other minerals from the lake. This water is diverted to shallow evaporation ponds where over time it is evaporated until the remaining brines have mineral concentrations sufficient to move on to the next step in the mineral extraction process.

It is estimated that approximately 260 acre-feet of culinary water from existing public community water systems is used annually for industrial purposes. This figure represents about 4 percent of the existing culinary water use and is almost entirely in Tooele County primarily in Tooele Valley.

The State Engineer's Office has surveyed and published statewide industrial water-use data for several years. Although the State Engineer's Office maintains confidentiality of the quantity of water used by individual industrial water users, the office has reported the collective 1995 total industrial water use in the West Desert Basin from privately held water rights as 13,760 acre-feet/year. The 1995 data on privately held industrial water rights is shown in Table 18-1. The majority of the privately developed industrial water comes from surface water sources. Kennecott Corporation exports 10,000 acre-feet per year to its Bingham canyon mining operation in the Jordan River Basin.

Well house (Tooele Valley)

2.19 GROUNDWATER

Most of the Great Salt Lake Desert area is underlain with groundwater, much of which unfortunately exceeds present drinking water standards for salinity and other parameters. Due to the low precipitation and the very high evaporation rate in the region, only limited amounts of water are available to replenish the groundwater aquifers. Groundwater quality in the basin is best when located along the margins of the mountain ranges where recharge takes place. In general, water quality decreases with distance from these recharge areas.

The largest and most dependable springs of the West Desert Basin are fed by these regional carbonate aquifers. Many carbonate aquifers extend beyond the boundaries of individual valleys. Their flow systems do not always conform to surface water divides.

Groundwater can be found virtually everywhere in Tooele Valley. In some areas it is at a greater depth than others. Some wells produce greater yields than others, but there are few areas in the valley where a well will not yield some water if it is drilled deep enough. Since 1963, the amount of groundwater withdrawal from wells has been as high as 33,000 acre-feet/year in 1974, but averages around 26,000 acre-feet per year.

The quality of the groundwater throughout the valley varies considerably. Generally, in the eastern portion of the county, groundwater recharge comes from the Oquirrh mountains and water quality ranges from good to excellent. To some extent the same principle holds for the south end of the valley recharged by the South Mountains and the west side of the valley recharged by the Stansbury Mountains. But, recharge in these areas is not as substantial as from the Oquirrhs. Consequently, water quality on the south and west sides of the valley is not as influenced by the recharge as it is on the east side of the valley. As groundwater moves towards the valley center and towards the Great Salt Lake water quality deteriorates and becomes more brackish as total dissolved solids concentrations approach 10,000 mg/l.

Total groundwater recharge for the Tooele Valley is estimated to be 57,000 acre-feet/year. Approximately two-thirds of the recharge (39,200 acre-feet/year) is attributed to the Oquirrh Mountains. Groundwater movement from Rush Valley accounts for 5,000 acre-feet/year, while the South Mountains only contribute 500 acre-feet/year. The Stansbury mountains provide an estimated 12,300 acre-feet of groundwater recharge.